

CLAIMS

1. A medical system comprising:

- a medical instrument to be guided in a patient body,
- X-Ray acquisition means for acquiring a two-dimensional X-ray image comprising a
5 projection of said medical instrument in accordance with a geometry of said X-Ray
acquisition means,
- ultrasound acquisition means for acquiring a three-dimensional ultrasound data set of said
medical instrument using an ultrasound probe,
- means for localizing said ultrasound probe within a referential of the X-ray acquisition
10 means,
- means for providing a first ultrasound localization of said medical instrument within a
referential of said ultrasound acquisition means,
- means for converting said first ultrasound localization within said referential of the
ultrasound acquisition means into a first X-ray localization within said referential of the
15 X-ray acquisition means, using said localization of the ultrasound probe,
- means for providing a second X-ray localization of said projection of the medical
instrument in a referential of said two-dimensional X-ray image,
- means for mapping said three-dimensional ultrasound data set with said two-dimensional
X-ray image in accordance with a transformation, which minimizes a distance between a
20 projection of said first X-ray localization on said two-dimensional X-Ray image in
accordance with said geometry of the X-Ray acquisition means and said second X-ray
localization,
- means for generating and displaying a bi-modal representation of said medical instrument
in which said two-dimensional X-ray image and said mapped three-dimensional
25 ultrasound data set are combined.

2. A system as claimed in claim 1, wherein said means for providing a first ultrasound
localization and said means for providing a second X-Ray localization of said medical
instrument comprise detection means for detecting localization features of said
30 medical instrument.

3. A system as claimed in claim 2, wherein said localization features comprise a
landmark of said medical instrument.

4. A system as claimed in claim 3, wherein said transformation comprises a translation.

5. A system as claimed in claim 2, wherein said localization features comprise a plurality of landmarks of said medical instrument.

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6. A system as claimed in claim 5, wherein said transformation comprises a translation and three rotations.

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7. A system as claimed in claim 1, wherein said transformation is intended to minimize a three-dimensional displacement of said first X-Ray localization.

8. A system as claimed in claim 5, wherein said plurality of landmarks belongs to said medical instrument and to at least a first and a second reference medical instruments.

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9. A system as claimed in claim 1, wherein said ultrasound probe localization allows to define a crop plane, which delimitates in the 3D ultrasound data set data to be removed from data to be used by the generating and display means for generating said bimodal representation.

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10. A method of guiding a medical instrument in a patient body, comprising the steps of:
- acquiring a two-dimensional X-ray image using an X-ray acquisition system, said two-dimensional X-ray image comprising a projection of said medical instrument in accordance with a geometry of said X-ray acquisition system,
 - acquiring a three-dimensional ultrasound data set of said medical instrument using said
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- ultrasound probe,
 - localizing said ultrasound probe in a referential of said X-ray acquisition system,
 - providing a first localization of said medical instrument within a referential of said 3D ultrasound data set,
 - converting said first localization within said referential of the 3D ultrasound data set into
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- a first X-Ray localization within said referential of the X-ray acquisition system,
 - providing a second localization of said projection of the medical instrument in a referential of the two-dimensional X-Ray image,
 - mapping said three-dimensional ultrasound data set with said two-dimensional X-ray image in accordance with a transformation, which minimizes a distance between a

projection of said first X-Ray localization on said two-dimensional X-Ray image in accordance with said geometry of the X-Ray acquisition means and said second localization,

- generating and displaying a bimodal representation of said medical instrument in which

5 both 2D X-ray image and said mapped 3D ultrasound data are combined.